

Name

Class



www.MathsTeacherHub.com

# Circle theorems

**(9 – 1) Topic booklet**

## Higher

These questions have been collated from previous years GCSE Mathematics papers.

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  - *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out**.
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

### Information

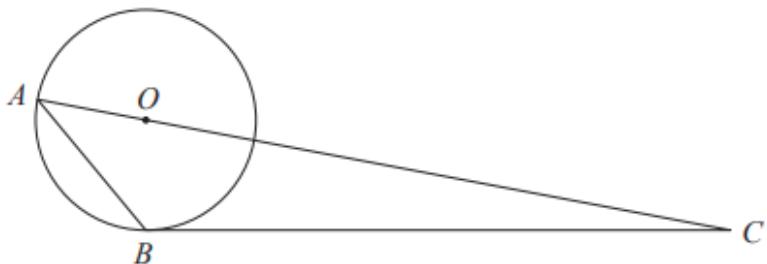
- The marks for **each** question are shown in brackets
  - *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

**Answer ALL questions**  
**Write your answers in the space provided.**  
**You must write down all the stages in your working.**

11



*A* and *B* are points on a circle, centre *O*.

*BC* is a tangent to the circle.

*AOC* is a straight line.

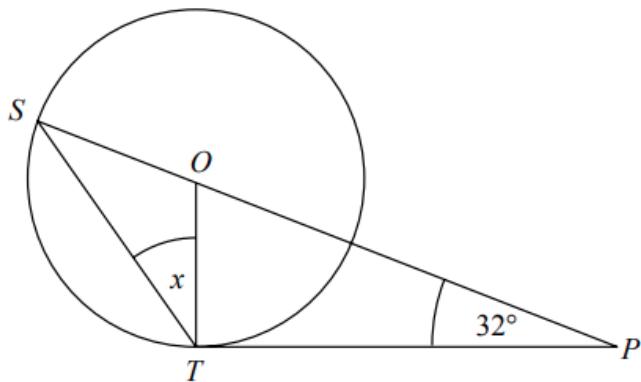
Angle  $ABO = x^\circ$ .

Find the size of angle  $ACB$ , in terms of  $x$ .

Give your answer in its simplest form.

Give reasons for each stage of your working.

11



$S$  and  $T$  are points on the circumference of a circle, centre  $O$ .

$PT$  is a tangent to the circle.

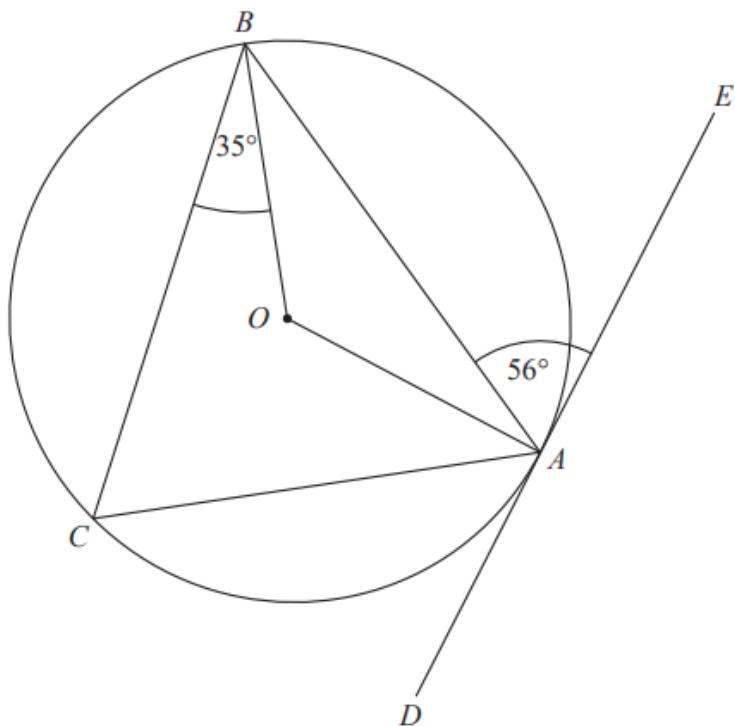
$SOP$  is a straight line.

Angle  $OPT = 32^\circ$

Work out the size of the angle marked  $x$ .

You must give a reason for each stage of your working.

12



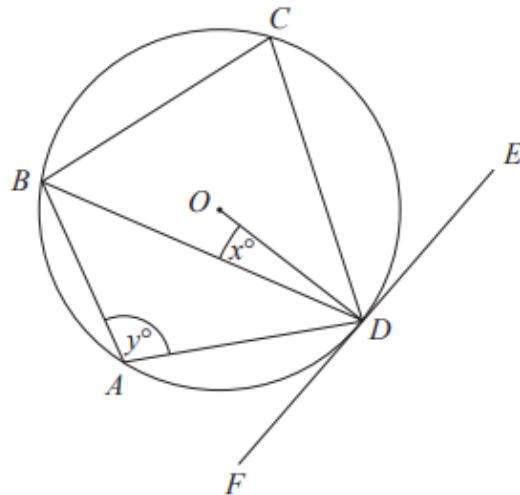
$A, B$  and  $C$  are points on the circumference of a circle, centre  $O$ .  
 $DAE$  is the tangent to the circle at  $A$ .

Angle  $BAE = 56^\circ$

Angle  $CBO = 35^\circ$

Work out the size of angle  $CAO$ .  
You must show all your working.

13



$A, B, C$  and  $D$  are points on the circumference of a circle, centre  $O$ .  
 $FDE$  is a tangent to the circle.

(a) Show that  $y - x = 90$

You must give a reason for each stage of your working.

(3)

Dylan was asked to give some possible values for  $x$  and  $y$ .

He said,

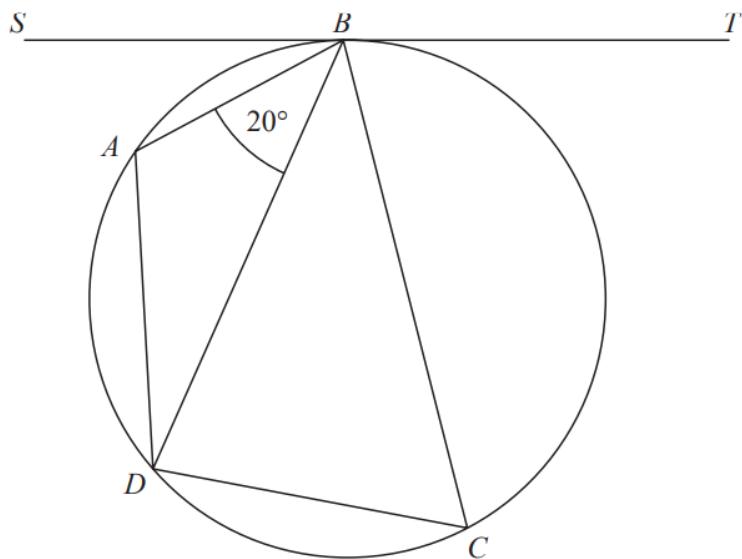
“ $y$  could be 200 and  $x$  could be 110, because  $200 - 110 = 90$ ”

(b) Is Dylan correct?

You must give a reason for your answer.

(1)

14



$A, B, C$  and  $D$  are four points on a circle.

$SBT$  is a tangent to the circle.

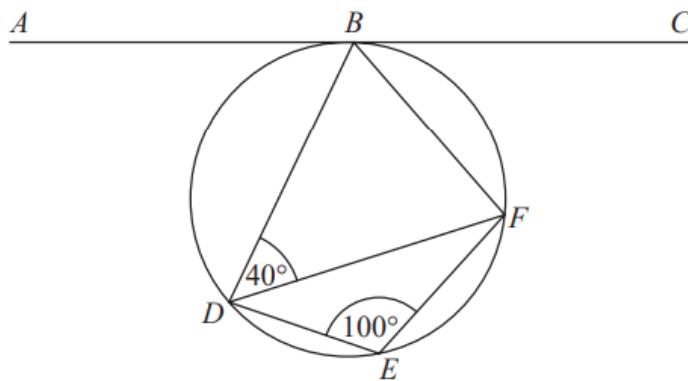
Angle  $ABD = 20^\circ$

the size of angle  $BAD$  : the size of angle  $BCD = 3 : 1$

Find the size of angle  $SBA$ .

Give a reason for each stage of your working.

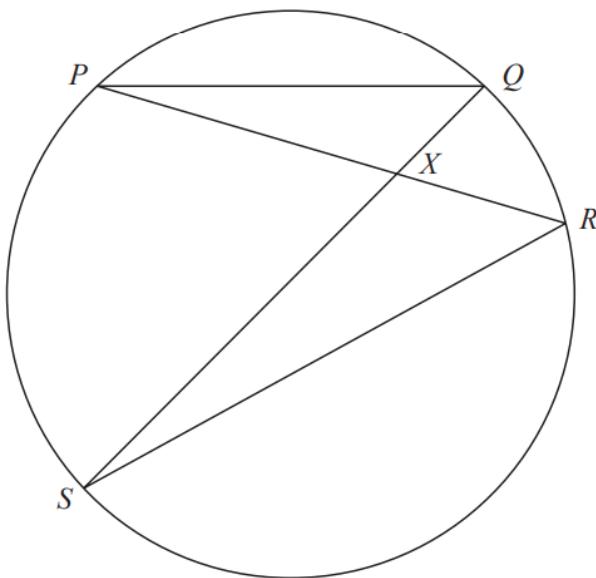
14



Points  $B, D, E$  and  $F$  lie on a circle.  
 $ABC$  is the tangent to the circle at  $B$ .

Find the size of angle  $ABD$ .  
You must give a reason for each stage of your working.

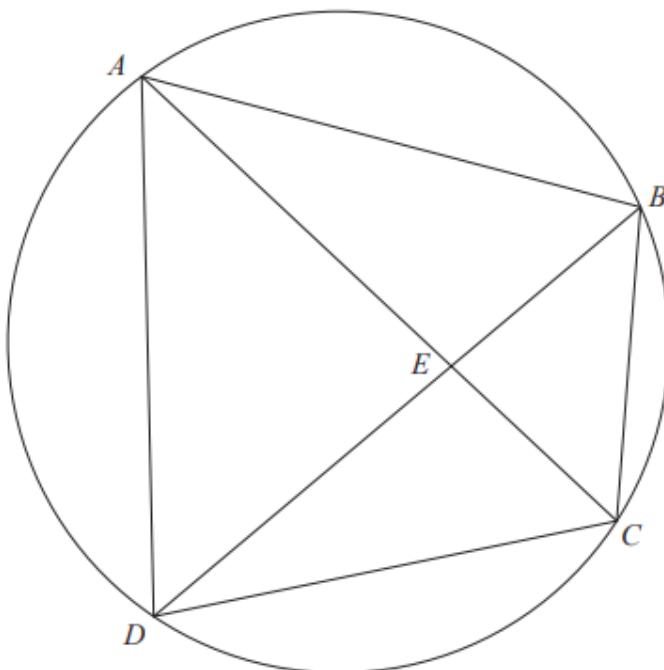
15  $P, Q, R$  and  $S$  are four points on a circle.



$PXQ$  and  $SXR$  are straight lines.

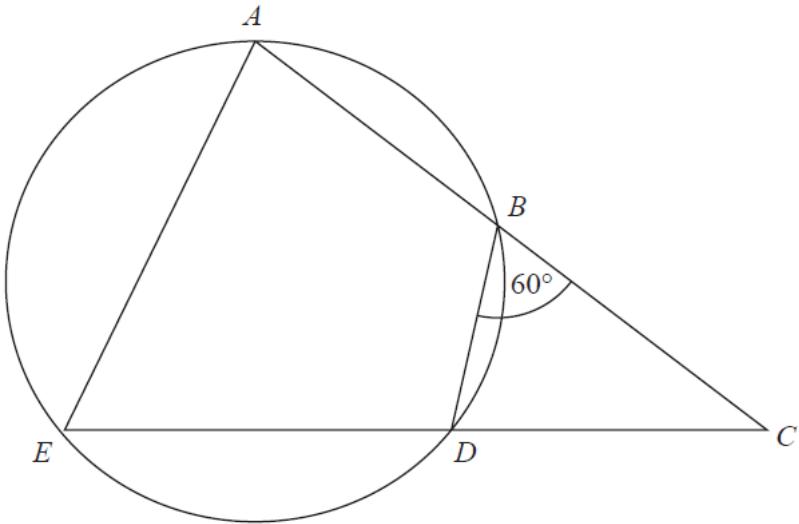
Prove that triangle  $PQX$  and triangle  $SRX$  are similar.

15  $A, B, C$  and  $D$  are four points on the circumference of a circle.



$AEC$  and  $BED$  are straight lines.

Prove that triangle  $ABE$  and triangle  $DCE$  are similar.  
You must give reasons for each stage of your working.



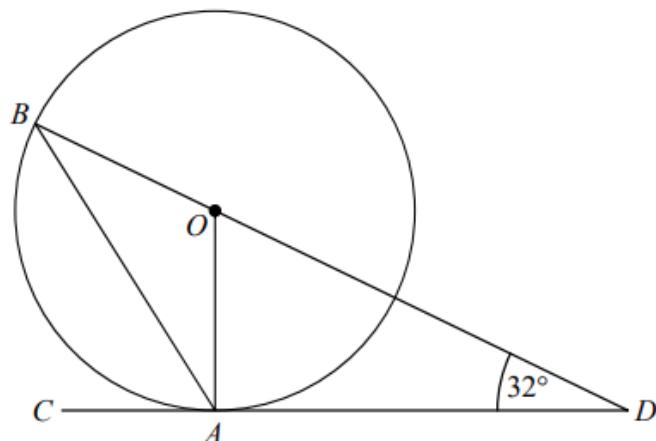
$ABDE$  is a cyclic quadrilateral.  
 $ABC$  and  $EDC$  are straight lines.  
Angle  $DBC = 60^\circ$

Given that

size of angle  $EAB$  : size of angle  $BCD = 2 : 1$

work out the size of angle  $BCD$ .  
You must show all your working.

17



$A$  and  $B$  are points on a circle with centre  $O$ .

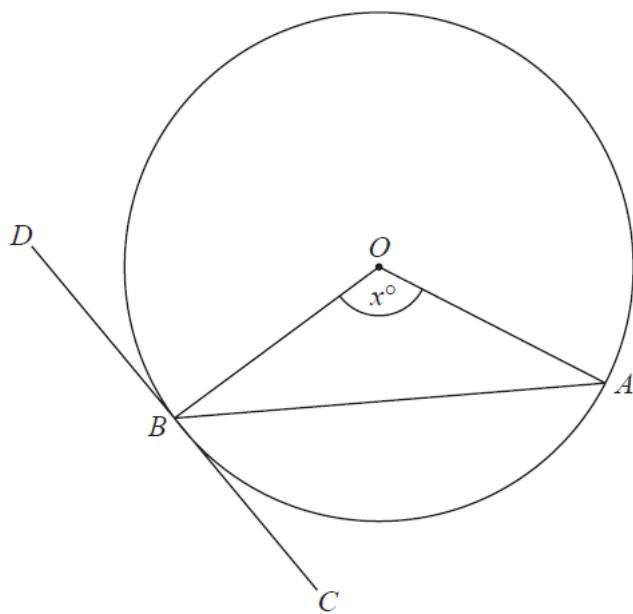
$CAD$  is the tangent to the circle at  $A$ .

$BOD$  is a straight line.

Angle  $ODA = 32^\circ$

Work out the size of angle  $CAB$ .

You must show all your working.



$A$  and  $B$  are points on a circle, centre  $O$ .

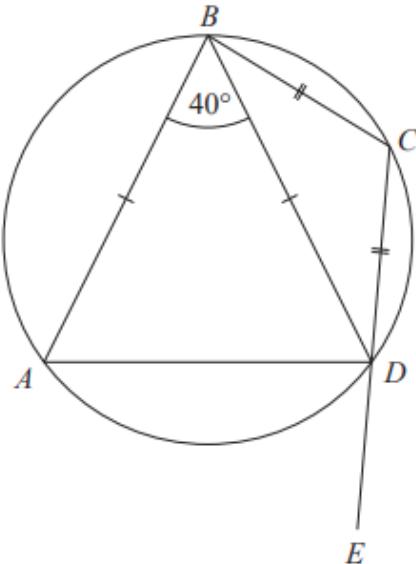
$DBC$  is the tangent to the circle at  $B$ .

Angle  $AOB = x^\circ$

Show that angle  $ABC = \frac{1}{2}x^\circ$

You must give a reason for each stage of your working.

18 The points  $A$ ,  $B$ ,  $C$  and  $D$  lie on a circle.  
 $CDE$  is a straight line.



$$BA = BD$$

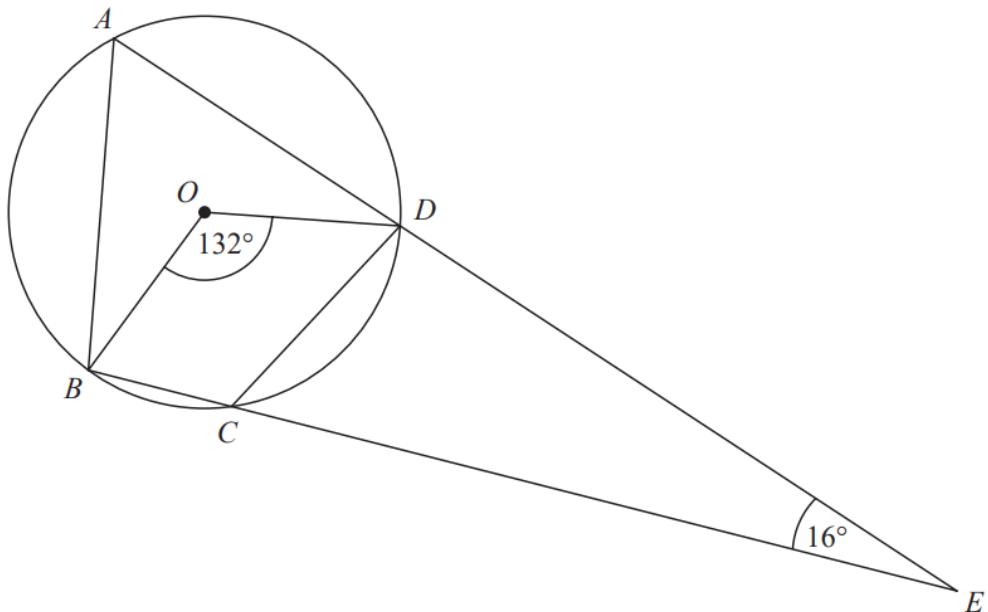
$$CB = CD$$

$$\text{Angle } ABD = 40^\circ$$

Work out the size of angle  $ADE$ .

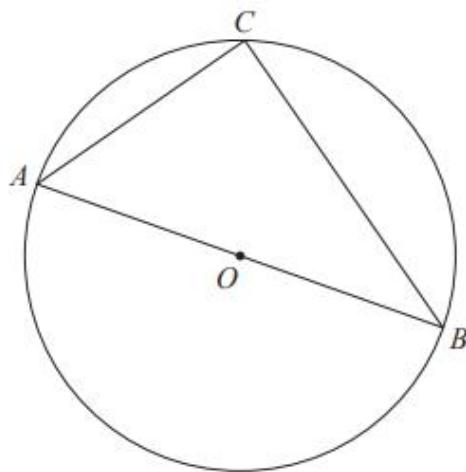
You must give a reason for each stage of your working.

20  $A, B, C$  and  $D$  are points on the circumference of a circle, centre  $O$ .  
 $ADE$  and  $BCE$  are straight lines.



Work out the size of angle  $CDE$ .

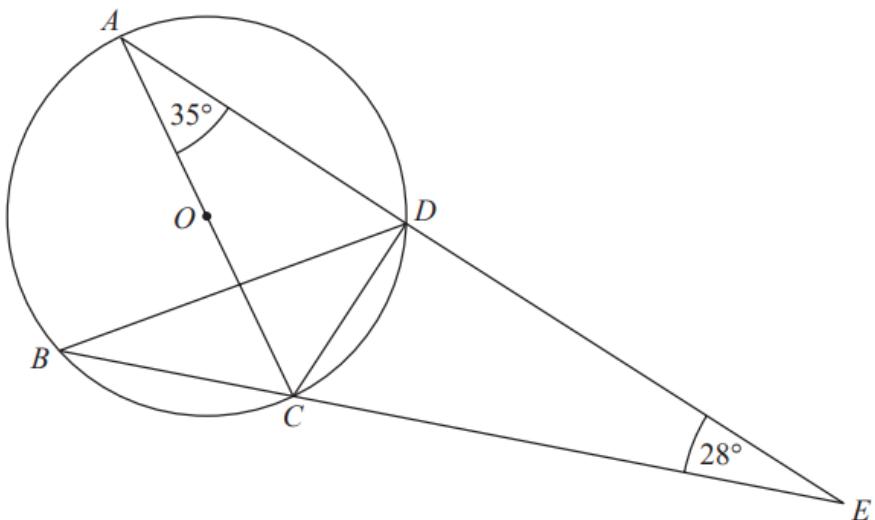
Give a reason for each stage of your working.



$A$ ,  $B$  and  $C$  are points on the circumference of a circle, centre  $O$ .  
 $AOB$  is a diameter of the circle.

Prove that angle  $ACB$  is  $90^\circ$   
You must **not** use any circle theorems in your proof.

21



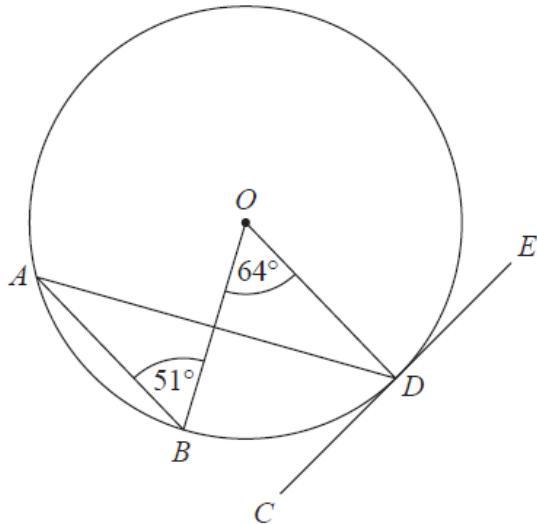
$A, B, C$  and  $D$  are points on the circumference of a circle, centre  $O$ .  
 $AC$  is a diameter of the circle.

$ADE$  and  $BCE$  are straight lines.

Work out the size of angle  $BDC$ .

Write down any circle theorems that you use.

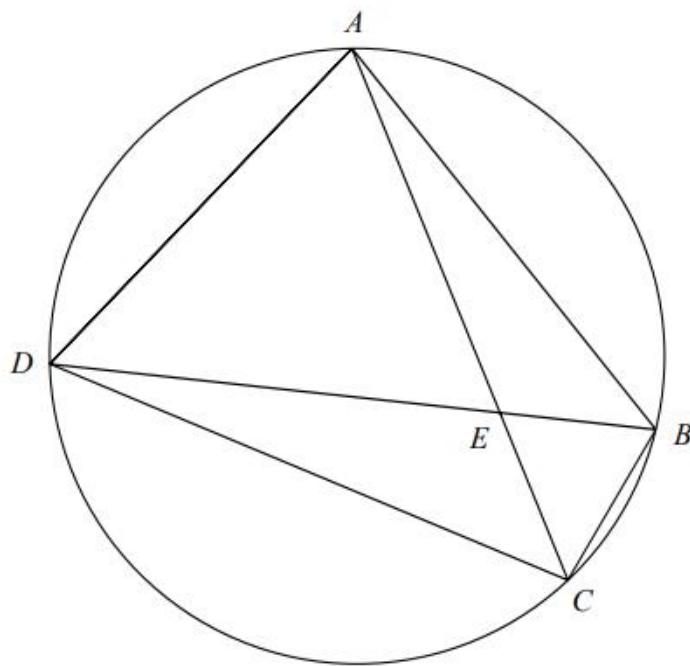
21  $A$ ,  $B$  and  $D$  are points on a circle with centre  $O$ .  
 $CDE$  is the tangent to the circle at  $D$ .



Work out the size of angle  $ADC$ .

Write down any circle theorems you use.

22  $A, B, C$  and  $D$  are four points on a circle.

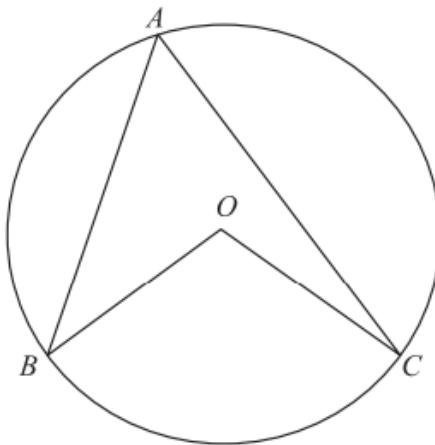


$AEC$  and  $DEB$  are straight lines.

Triangle  $AED$  is an equilateral triangle.

Prove that triangle  $ABC$  is congruent to triangle  $DCB$ .

24  $A$ ,  $B$  and  $C$  are points on the circumference of a circle centre  $O$ .



Prove that angle  $BOC$  is twice the size of angle  $BAC$ .